Cyrano Sciences

Distributed Monitoring for
Weapons of Mass Destruction
for Homeland Security

Company Overview

- Founded 1997; spin-off technologies from Caltech and NASA/JPL
- Private, venture capital backed ($43MM)
- 21 issued patents, 30 more patents pending
- Facility - 17,000 square feet - Pasadena, CA
- 24 employees
- First product, Cyranose™ 320 launched in 2000

The Threat

- Today's terrorist is flexible, opportunistic, patient, creative, resourceful and well-informed
- Harbor a complex mix of economic, political and psychological objectives
- They match the weapon to the target
- End-to-end awareness is crucial

Critical Infrastructure

- Agriculture and Food
- Water
- Public Health
- Emergency Services
- Defense Industrial Base
- Telecommunication
- Energy
- Transportation
- Banking and Finance
- Chemicals and Hazardous Materials
- Postal and Shipping
- Banking and Finance
- Chemicals and Hazardous Materials
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Transportation Assets*

- Aviation
  - 5,000 public airports
- Passenger Rail and Railroads
  - 120,000 miles of major railroads
- Highways, Trucking, and Busing
  - 590,000 highway bridges
- Pipelines
  - 2 million miles of pipelines
- Maritime
  - 300 inland/costal ports
- Mass Transit
  - 500 major urban public transit operators

*** Source: Strategy for the Physical Protection of Critical Infrastructures and Key As**

Key Assets*

- National Monuments and Icons
  - 5,800 historic buildings
- Nuclear Power Plants
  - 104 commercial nuclear power plants
- Dams
  - 80,000 dams
- Government Facilities
  - 3,000 government owned/operated facilities
- Commercial Assets
  - 460 sky scrapers
  - 26,600 FDIC insured institutions
  - 66,000 chemical plants

*** Source: Strategy for the Physical Protection of Critical Infrastructures and Key As**

The Security Challenge

- 85% of critical infrastructure and key assets are privately owned
- These assets are constantly changing to meet the needs of the markets they serve
- The security burden falls upon a complex mix of private and public organizations
- Costs of security fall on all levels of both the private and public sector

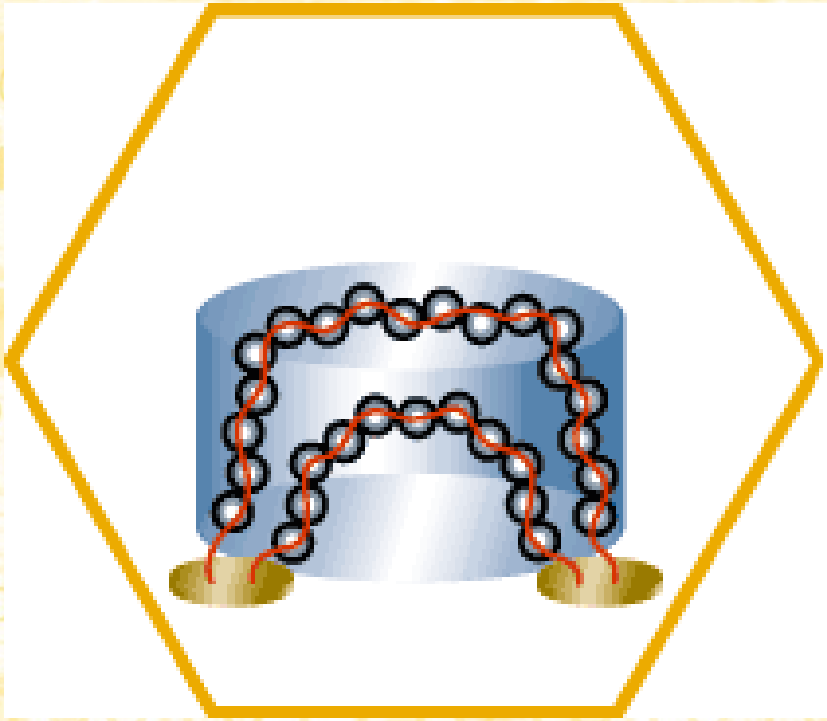
The Detection Challenge

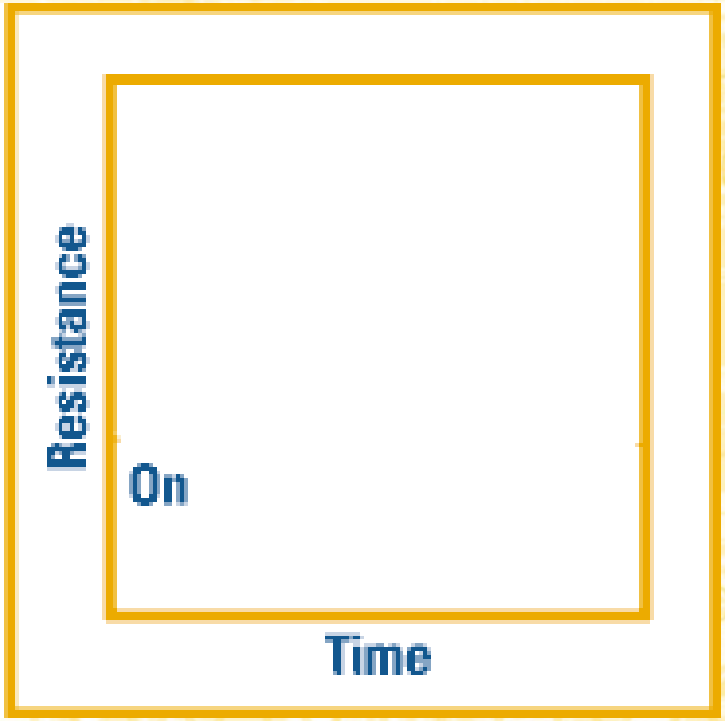
- The Challenge:
  - To provide comprehensive CBRNEF security to protect infrastructure and personnel
- The Solution:
  - Intelligent Sensor Network
    - Sensor Nodes
      - Low cost/low power
      - Ability to detect and alarm
    - Data Aggregation and Interpretation
      - Aggregation and interpretation of multiple sensor inputs
      - Centralized or distributed intelligence
      - Automated detection and notification

Key Benefits of an Intelligent Sensor Network

- Reduced vulnerability to acts of terrorism
- Reduced economic loss and injuries from fires and accidental release of chemicals in transit or at loading or sorting facilities
- System Features;
  - Scalable, flexible, adaptable sensors,
    - Chemical, fire, biological, explosives and radiological
  - Architecture includes;
    - Hub and spoke
    - Peer to peer
    - Wired or wireless

Cyrano Sensor Technology



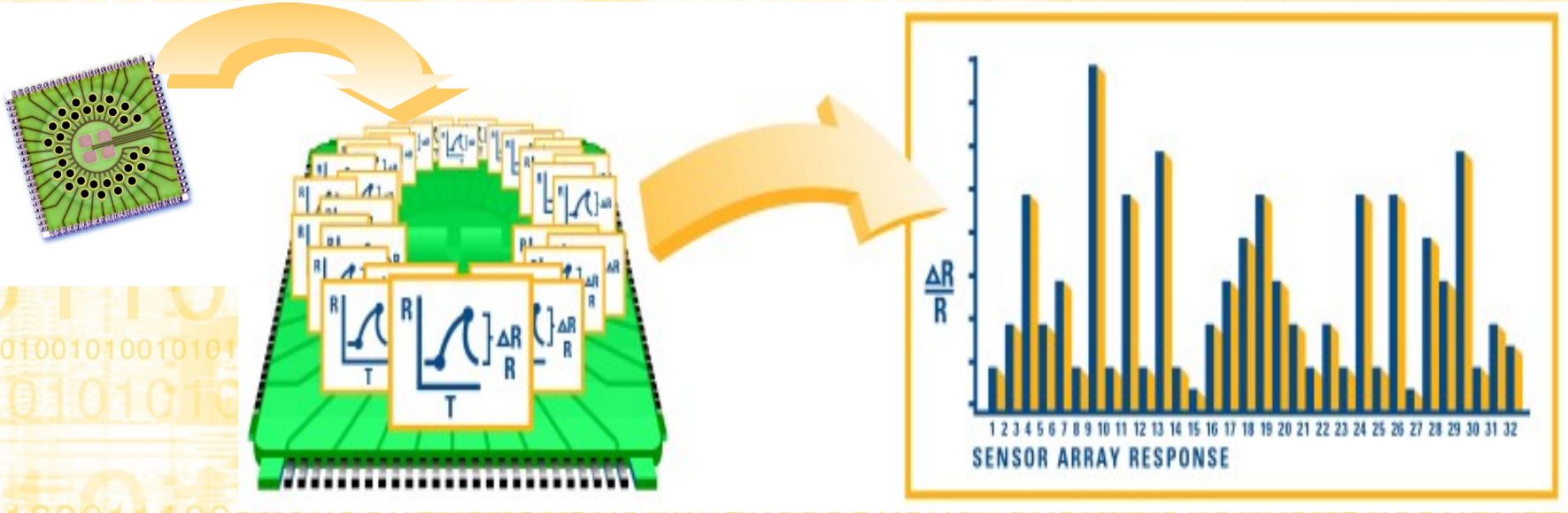


The vapor passes over the organic matrix and the swelling produces a change in resistance

A relative resistance measurement is made for each of the 32 sensors

Sensor Technology

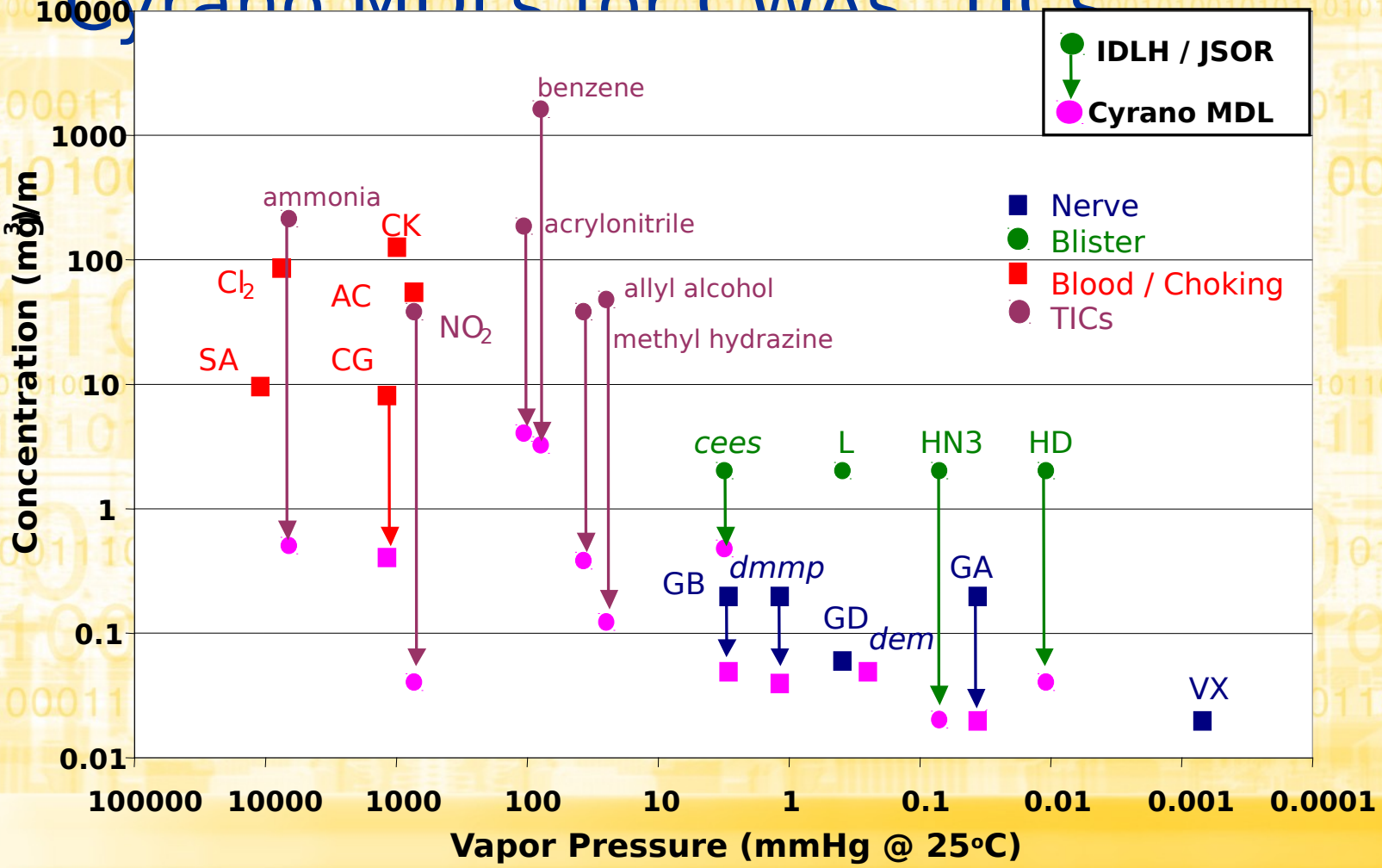
Array Based Chemical Sensing



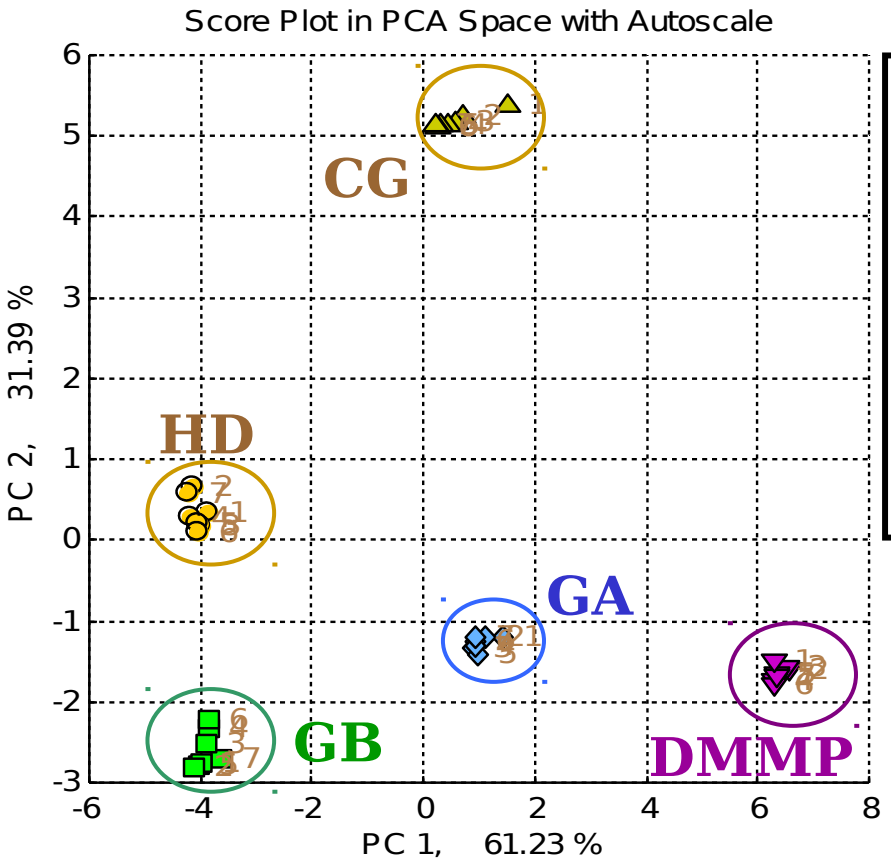
Using proprietary pattern matching algorithms, the data is converted into a unique response pattern

Broad Based Chemical Sensing

Cyrano MDLs for CWAs, TICs



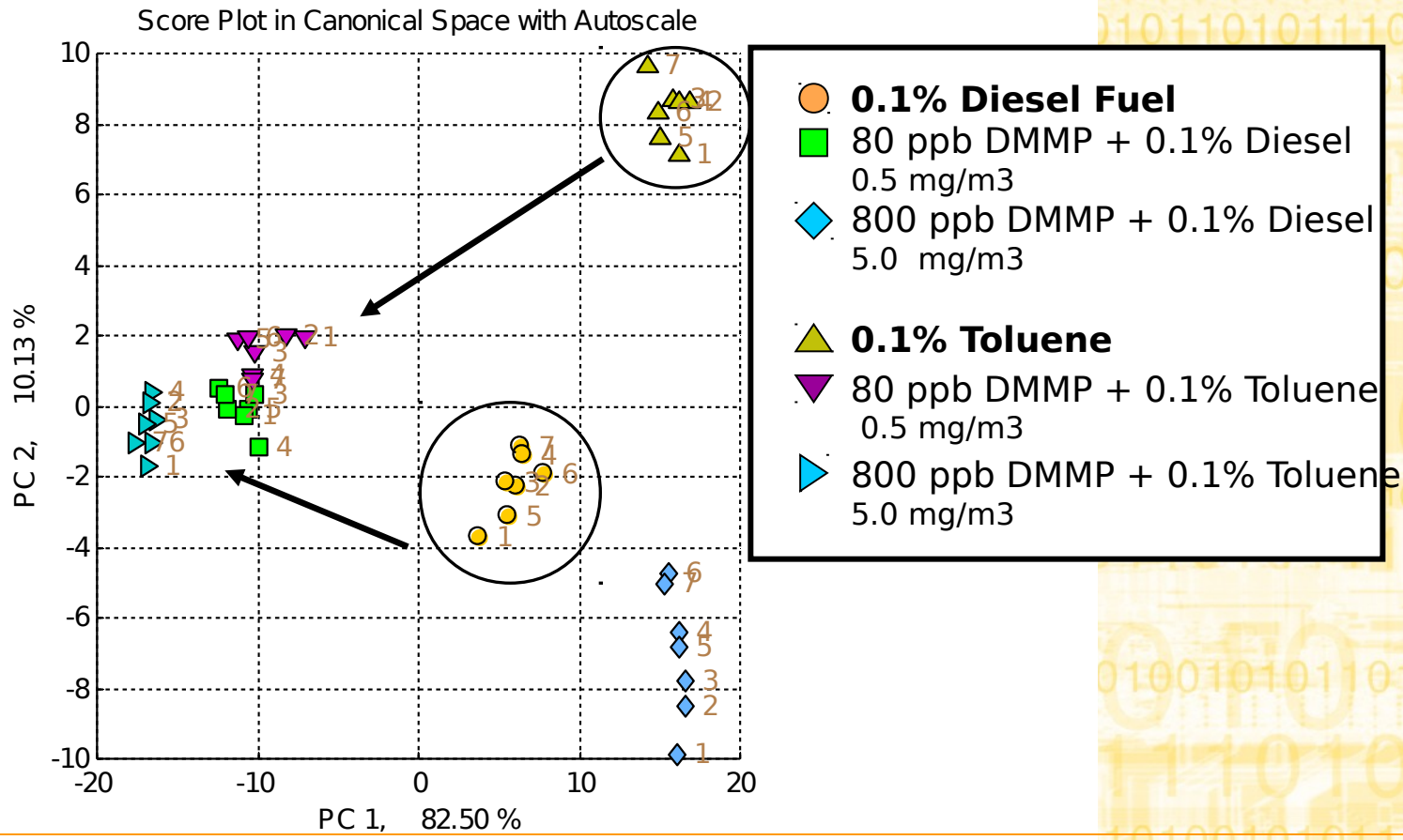
Chemical Agent Identification



Phosgene	137 ppm
HD (blister)	230 ppb 1.5 mg/m3
GB (sarin)	59 ppb 0.4 mg/m3
GA (tabun)	75 ppb 0.5 mg/m3
DMMP	79 ppb 0.4 mg/m3

Chemical agent identification is possible with our proprietary core technology

Interferents & Humidity



Identification of CWAs with interferents (mixtures) is possible with array-based sensing

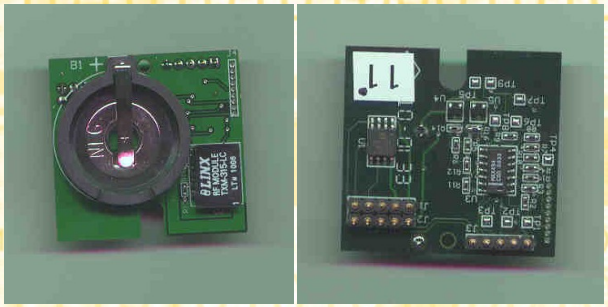
Cyrano Product Platforms

COTS Hand-Held

Cyranose 320™

- Fully integrated hand held device
- Measurement at

Miniaturized Sensing

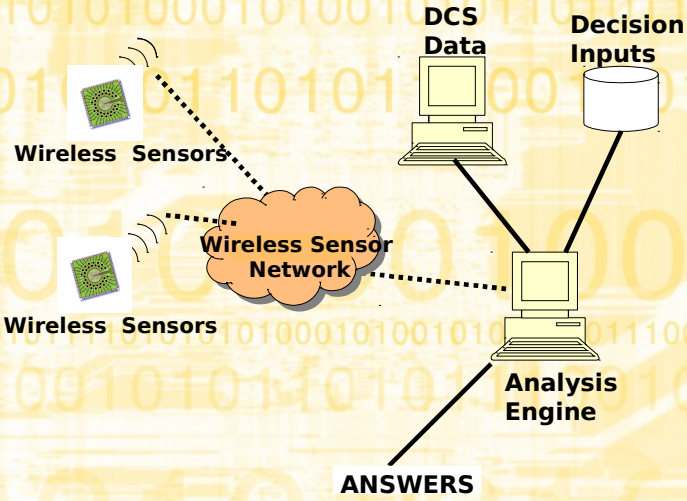


Front Back

NoseChip™

- Unattended distributed sensing
- Local alarm or networked device
- CW now, BW in development with US Marine Corp CBIRF

Networking

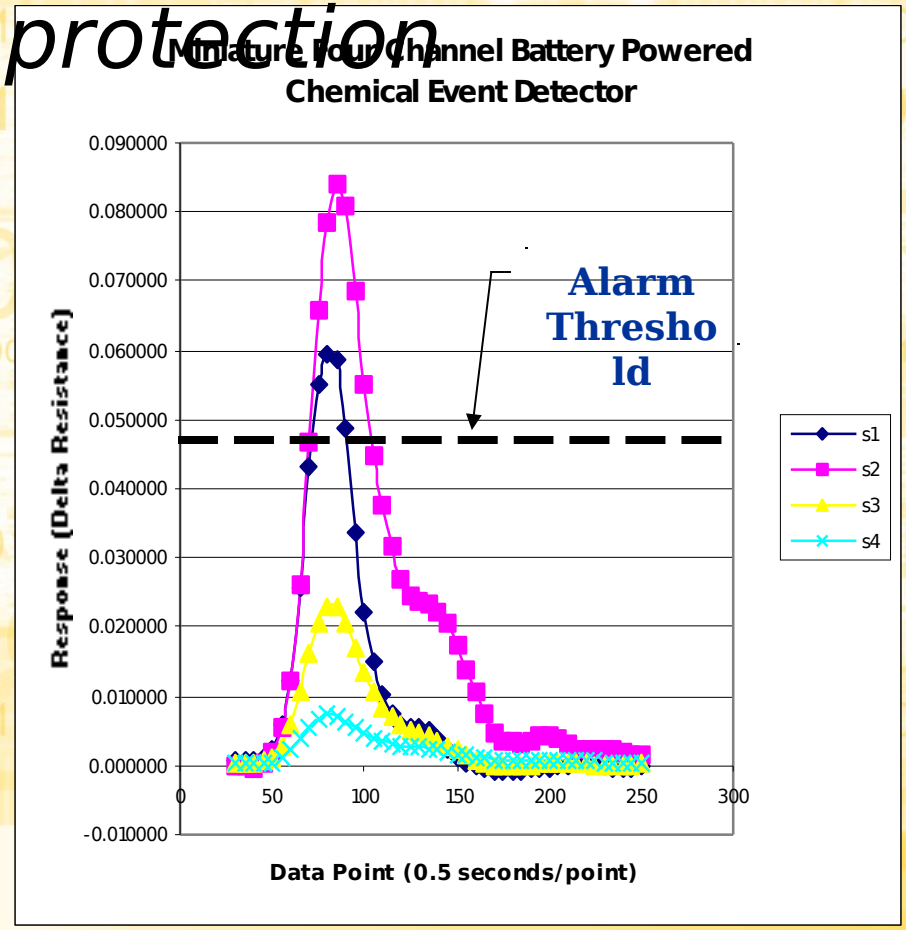


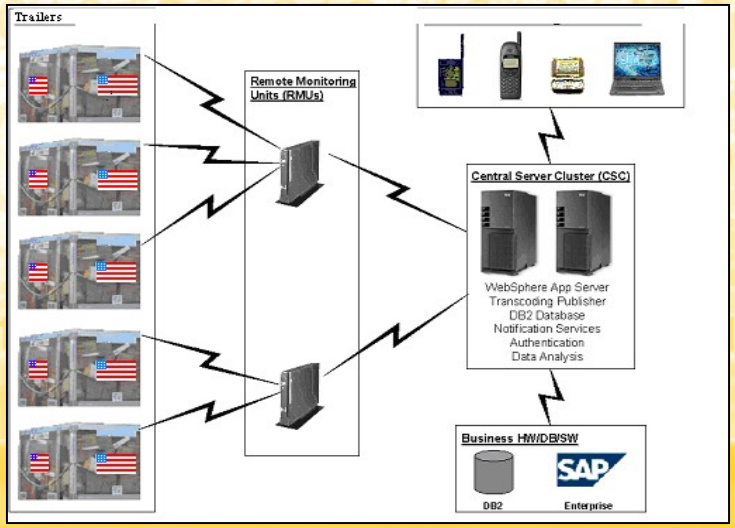
Sensigent™

- Wireless or wired sensor network
- Integrated data interpretation (DAIS™)

Cyrano Sciences Solution

To create an end-to-end train of awareness for infrastructure protection





NoseChip™ Devices

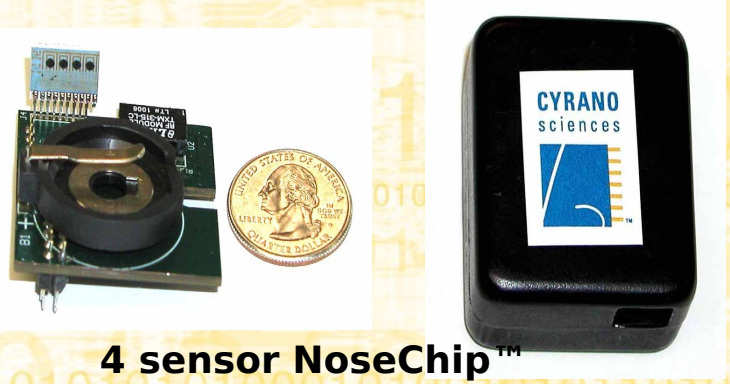
Low cost chemical sensors with optional short-range wireless capability (<300 feet), intended to provide chemical detectors across a number of applications.

Key applications:

- Widely dispersed sensing nodes for facilities protection
- Temporary or permanent networks

Specifications:

- Low Cost, <$1- 10
- Low Power, Nanowatt
- Lightweight, ~ .5 oz

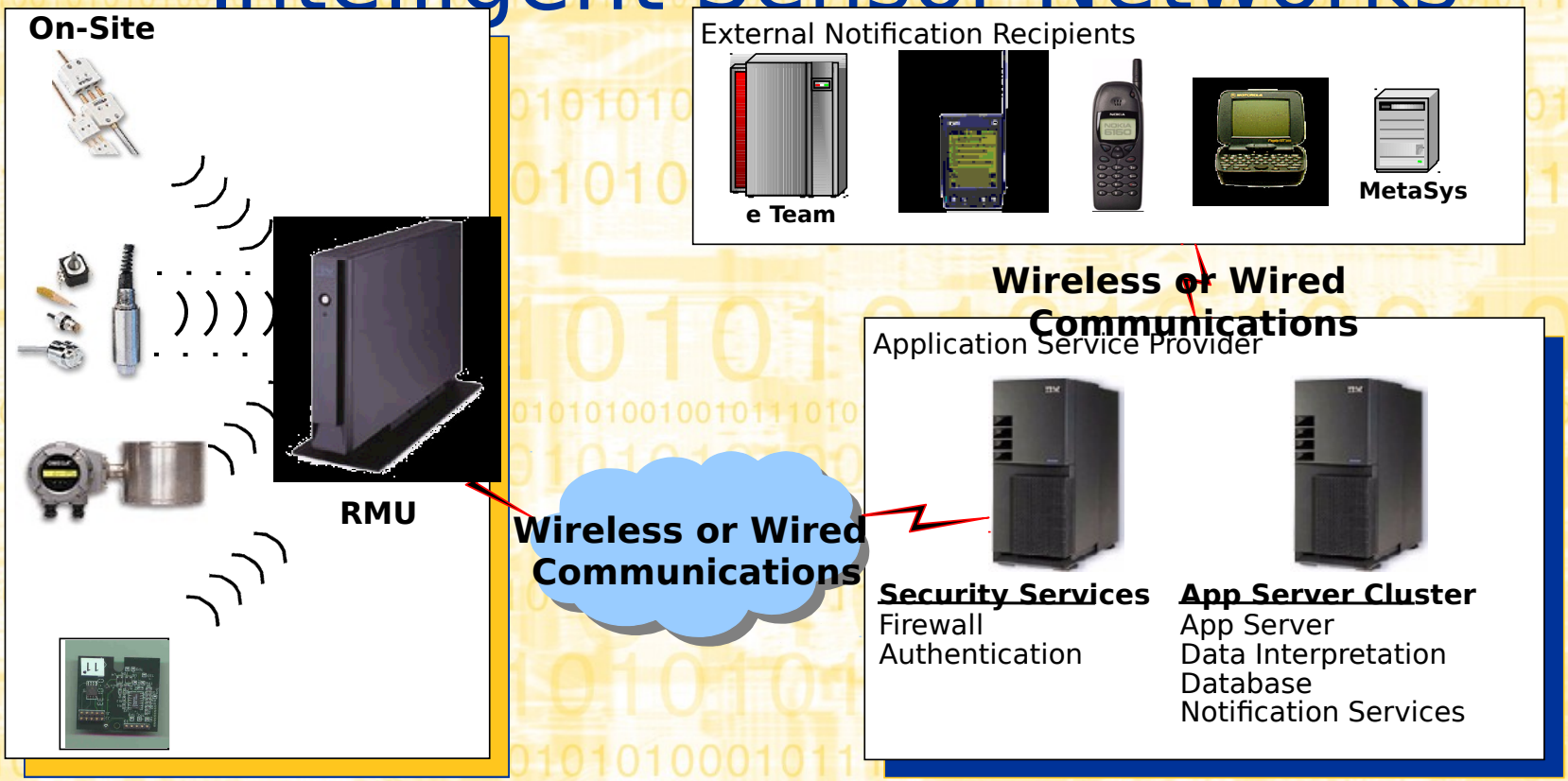


4 sensor NoseChip™ and housing

low cost • low power • robust sensors

Equipped with proprietary event detection software that reduces false alarms while maintaining required sensitivity.

Sensigent™
Intelligent Sensor Networks



End to end sensing, communication, interpretation, & notification

Sensigent™ Solutions

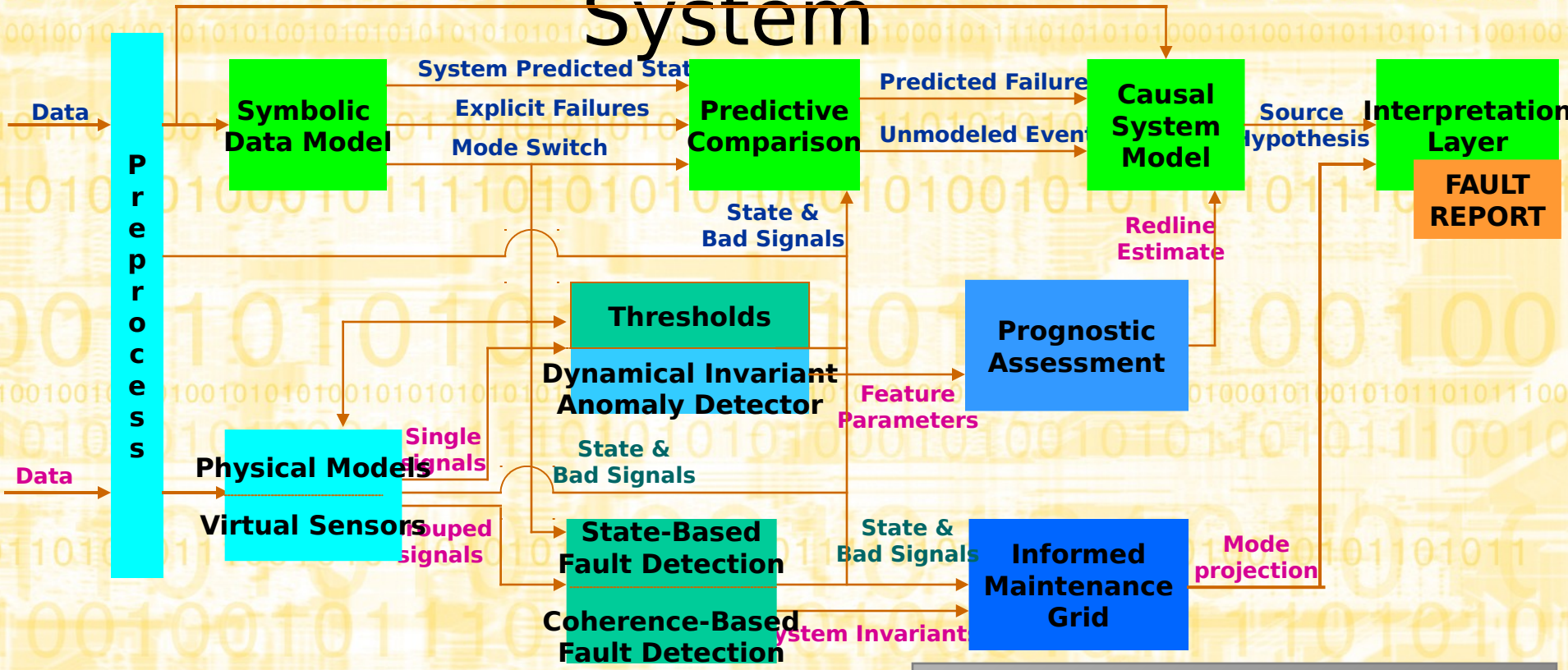
- 802.11b network of chemical sensors
  - 300ft line of site
  - Centralized alarm management
  - Automated notification
- 900MHz rf mixed sensor network
  - 20 mile line of site
  - Up to 2 month battery operation
  - Multiple sensor inputs
- 400MHz rf chemical sensor network
  - 300 ft line of site (expandable to 20 miles)
  - Up to 200 low cost chemical detection nodes
  - Up to one year battery life

Cyrano Technology
Sensor Networking

- DAIS- Data Analysis Interpretation Software
  - Multiple inputs to improve detection
  - Fuses different data sources
  - Fully integrated for training and prediction
  - Automatically determines most important data
  - Multivariate calibration routine
- Sensigent™ - Intelligent Sensor Networks
  - Aggregation and interpretation of multiple sensor inputs
  - Centralized or distributed intelligence
  - Automated detection and notification

DAIS™

Data Analysis Interpretation System



omprehensive data analysis, anomaly detection, and prognostication system

Sensigent™ Key Capabilities

- Fully integrated proprietary detection, communication, interpretation, and network-enabled notification
- Diagnostics and prognostics of sensor / instrument / system health
- Simple integration of next generation sensors and detectors
- Centralized or distributed intelligence
- Wired or wireless communications

Distributed Monitoring

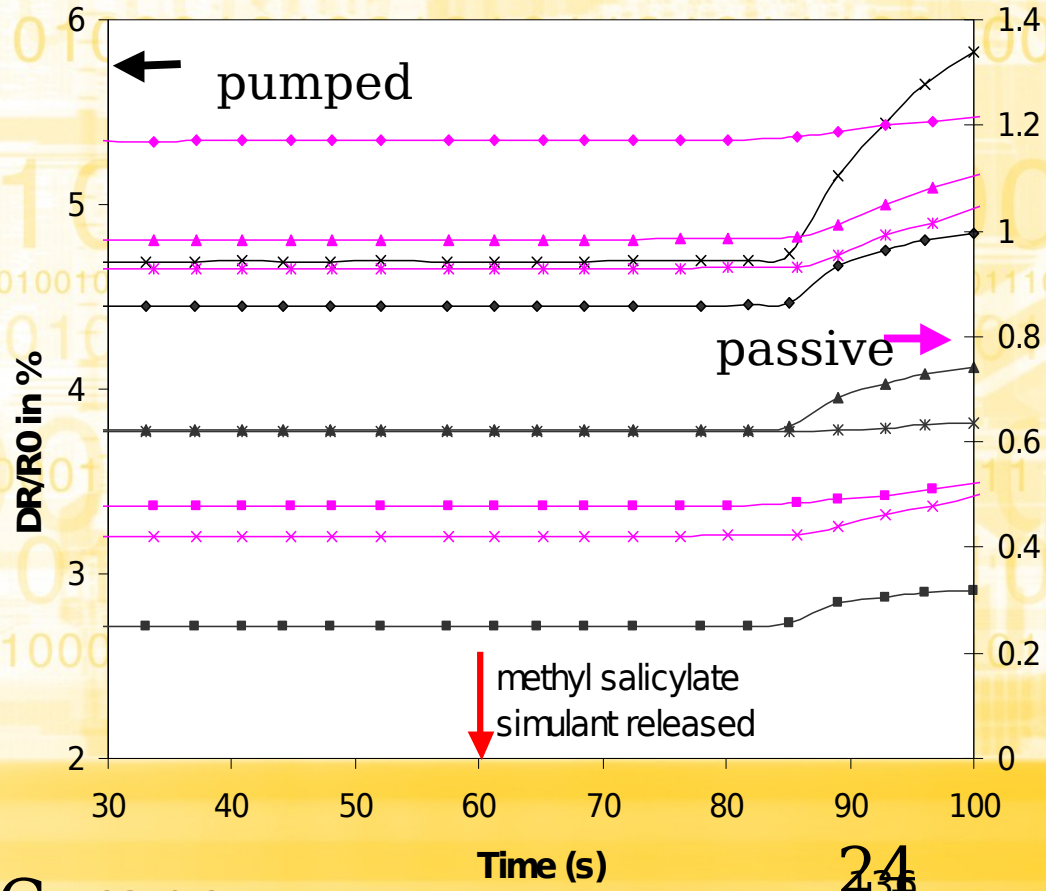
Specification

- Plug and play connectivity for CBRNEF sensor suite
- Multi-year battery life (no wires!!)
- Chem, fire, and rad/nuc currently available
- Integrated sensor fusion to reduce false alarms
- Permanent or temporary installation
- Costs comparable to current fire systems

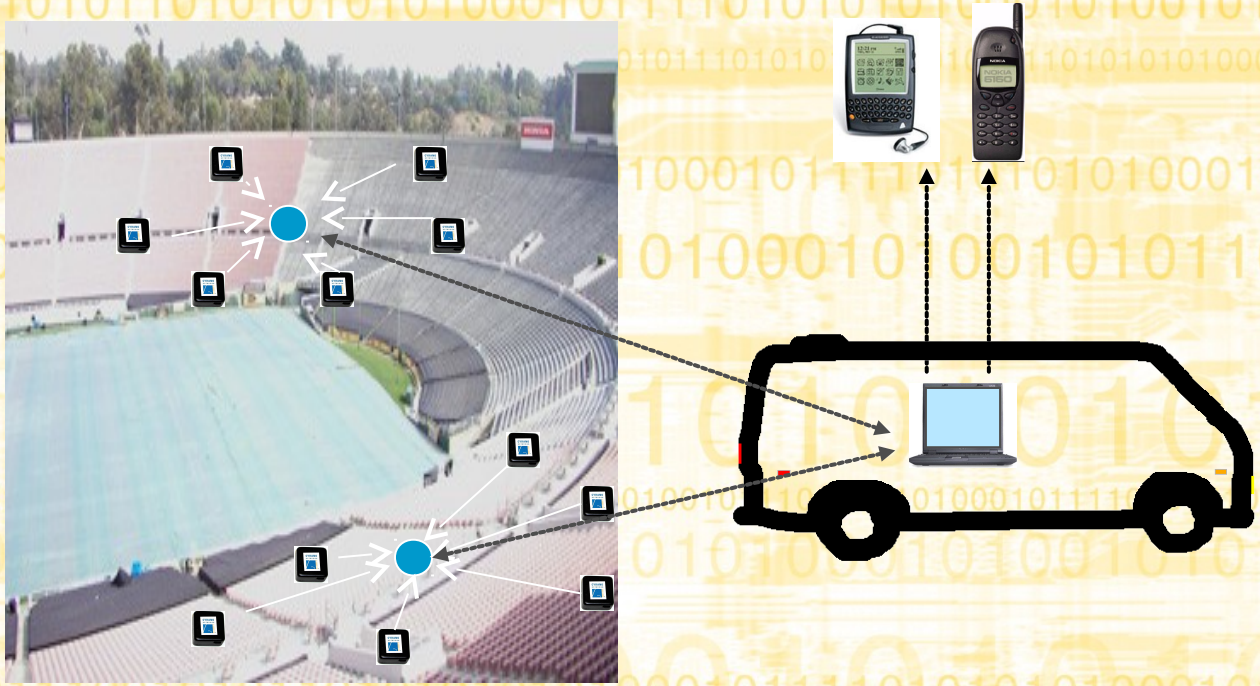
Temporary

Facilities Protection

Rose Bowl Game Pasadena, CA January 2, 2003
Simulated Nerve Agent Release in Access Tunnel



Centralized/Mobile Command



- Distributed sensor network
- Central data fusion and analysis

Sensigent™

Temporary Wireless Installation

Measurement No

LAN/WAN Interface

- Diagnostics aid
- Peer to peer communications
- Battery operated
- Generic sensor interface (T, P, light, etc.)
- Temporary (2-8 weeks)
- Industrially hardened (weather, temperature, explosive environment)
- Secure

Cargo Security Needs

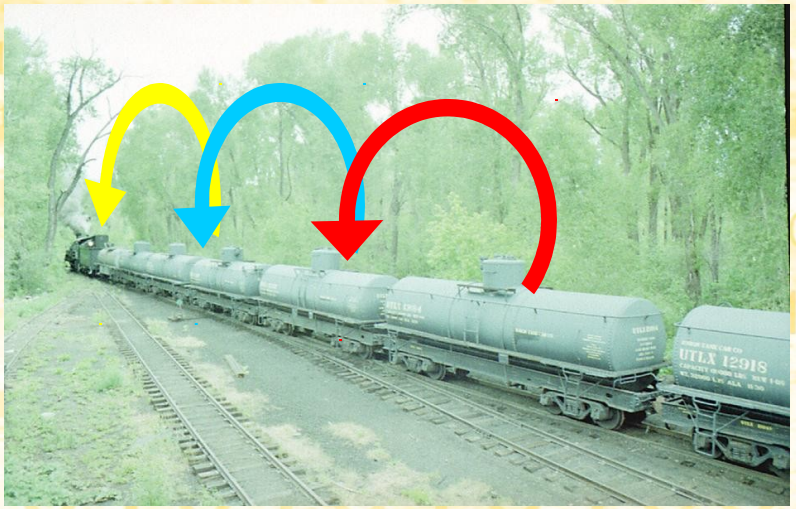
- Continuous Security Coverage
- Detect fires, chemicals at IDLH levels, radialogical/nuclear materials, biologicals, explosives

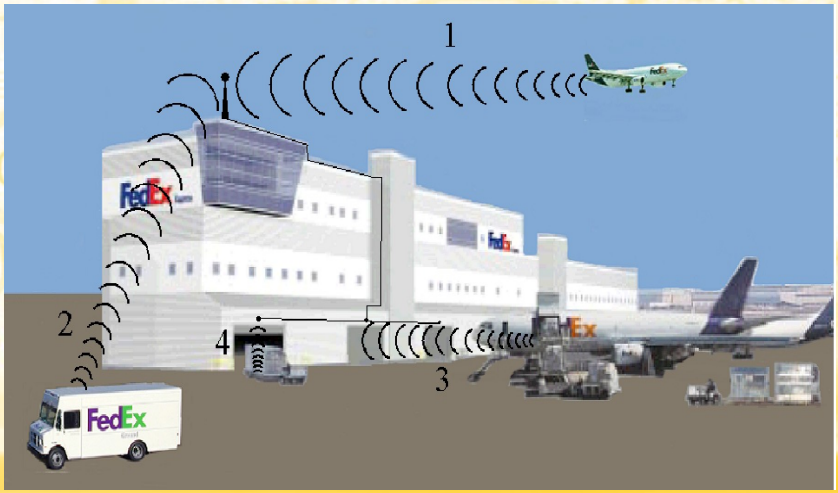
- Environmentally and physically rugged
- Low cost, battery powered system
- Wireless communication and network

Cyrano Sciences Solution

Ubiquitous sensing using Cyrano sensors and system

- Miniature low cost detectors
- Peer-to-Peer and Hub- and –Spoke Wireless Networks
- Alarm Interpretation and Notification Software





Summary

- Integrated CBRNEF sensor network
- Plug and play simplicity
- Low power/long battery life system
- Temporary or permanent installation
- Data fusion and interpretation software for false alarm reduction
- Automatic notification